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Manganese-enhanced magnetic resonance imaging of breast cancer cells

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There has been continued interest in engineering MRI contrast agents (CAs) and evaluating their diagnostic efficacy to overcome issues associated with clinically-approved CAs such as Gd-DTPA. Of particular interest are intracellular CAs that can provide sensitive identification of labelled cells, opening the possibility of directly detecting early changes driving cancers at the cellular level before vasculature has been fully formed. To further explore the capabilities of intracellular CAs in T1-weighted MRI of breast cancer, this work aimed at (1) demonstrating the potential of $MnCl_2$-enhanced MRI to detect and characterize early small breast tumors *in vivo* (2) investigating the potential of manganese-porphyrin-enhanced MRI for sensitive detection of multiple clinical subtypes of breast cancer cells (3) utilizing quantitative MRI to demonstrate the role the balance between hydrophilicity and hydrophobicity plays in developing CAs for effective T1-weighted MRI of cancer. This work has shown that $MnCl_2$, unlike Gd-DTPA, provided enhancement of the entire tumor mass, depicting both tumor borders and interior morphology. At the early stage of tumor growth, $MnCl_2$ also enabled cancer subtype-dependent differential enhancement and characterization. Moreover, this work demonstrated the superior T1 enhancement capabilities of manganese porphyrins over Gd-DTPA of multiple clinical subtypes of breast cancer cells at 3.0T. Also, using quantitative MRI, the more hydrophobic manganese porphyrin, $MnTPPS_3NH_2$, is shown to be a more sensitive T1 CA than $MnTPPS_4$ for cellular imaging of breast cancers. Such sensitive cellular detection can potentially lead to lowering the dose needed to achieve positive enhancement and merits further future *in vivo* investigation.

Biography

Mosa Alhamami earned his PhD from the University of Toronto for his work on manganese-enhanced MRI of breast cancers. His research was recognized with more than $130,000 of scholarships from local and federal funding sources and was nominated to represent the University of Toronto at the national competition for the Vanier Canada Graduate Scholarship and the provincial competition for the Ontario Women's Health Scholars Award. Since July 2016, Dr Alhamami has been a Scientific Reviewer for the Journal of Magnetic Resonance Imaging and was recognized by the International Society for Magnetic Resonance in Medicine for his service to the journal.

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